Salt Creek:

"In the beginning there was Salt Creek…." And since settlement, man has tried to take dominion over it. The prairies were plowed, runoff and erosion increased, mill dams were installed, and sewage was drained to the Creek. Also, since settlement, efforts have been made to control this flooding, channel erosion, and protect water quality on Salt Creek. These efforts can be characterized by three distinct phases representing the flood control philosophies and practices of those particular eras: (1) straighten the channels to get water flowing quickly away, (2) build dams and levees to temporarily slow and store water in the watershed and contain flood waters, and (3) acknowledge the inevitability of flooding and manage flood prone areas to minimize damages and loss of life.

The Salt Creek is a major tributary to the Platte River and has a total drainage area of 1,640 square miles. The upper part of the watershed, south of Pioneers Boulevard, has a drainage area of 220 square miles and the total drainage area at Superior Street is 697 square miles. The city of Lincoln covers approximately 70 square miles, all of which drains into Salt Creek, and the rest of the watershed is predominately nondeveloped agricultural lands and acreages. Salt Creek through Lincoln was straightened as a flood control program during the early and mid 1900s by the Sanitary District #1 of Lancaster County. In 1958, Congress approved the Salt Valley Flood Control Project which included 10 dams and an improved channel and levees through Lincoln. This project was implemented by the Salt Valley Watershed District between 1962 and 1968. Flood plain studies done in the late 1960s and later adopted by the City for flood plain administration showed essentially the Salt Creek channel contained the 100-year flood. The Lower Platte South Natural Resources District (NRD) replaced the Watershed District in 1972. In the late 1970s an updated flood insurance study indicated that the levees provided protection from only a 50-year flood and extensive areas were placed back in the floodplain. Maps from this study were adopted by the City in 1986. This updated study used modern and more extensive modeling, 20+ more years of actual data, and revised assumptions.

The NRD in 1989 requested the Corps of Engineers study Salt Creek and its major tributaries to determine if there was a feasible project to increase the level of flood protection on Salt Creek. This Reconnaissance Level Report was completed in 1991, finding an economically feasible project to provide a higher level of flood protection to certain areas along Salt Creek might exist, and recommended a Feasibility Phase Study.

In the Feasibility Phase Study, the Corps developed more detailed hydrologic and hydraulic models and investigated a wide range of structural alternatives to increase flood protection. These alternatives included upstream flood control dams, enlarging and deepening the channel, raising and lengthening a number of the bridges, raising all or sections of the levees, and temporary detention basins on the tributaries. None of these structural alternatives were found to have benefits greater than the costs and were determined by the Corps to be ineligible for federal financial assistance. (This does not mean that they are not technically feasible, or that the locals could not proceed to implement them on their own.)

Ten Corps of Engineers flood control dams control 26% of the drainage area upstream of Lincoln in the watershed, along with another 60 smaller flood control dams. The channel through Lincoln includes 7.25 miles of flood control levees, from Calvert Street to Superior Street. This system was originally designed to control the 100-year flood through Lincoln, but now only provides between 50- and 100-year protection. There are 1091 buildings in the 100-year flood plain, 868 residential and 223 commercial; 443 buildings are within the 50-year flood plain and 20 in the 10-year.

The Corps shifted focus to non-structural solutions, developed recommendations for an improved Flood Warning System and will assist the City and the NRD in implementing this System. (The initial floodwarning system is in place and functional; a more thorough explanation will be provided in a subsequent report.) They provided other recommendations for non-structural efforts which the City and NRD will be pursuing to help minimize or reduce existing projected flood damages and to avoid additional future damages. Flood insurance, floodproofing or raising structures above the floodplain, relocation of structures, raising of bridges, upstream detention storage, and modified stormwater management and floodplain regulations are among these alternatives.

Beal Slough

Beal Slough starts just west of the Village of Cheney at 91st and Highway 2 and runs northwesterly, paralleling Highway 2, entering Salt Creek at approximately SW 3rd and Pioneers Blvd.

The watershed includes 13.5 square miles of drainage, 75% of which is currently developed as urban. (Estimated 95% developed by 2015.) In 1978, when the FIS was done, only 40% was developed.

The stream channel has degraded both vertically (deepened) and horizontally (widened) due to increase volumes and peaks of runoff, to the point where there are critically unstable areas, and sometimes exposing and threatening buried and overhead utilities, bridges, and trails. The storm runoff rates have increased in the last 20-25 years by about 30% in the mid to upper reaches of the watershed and by as much as 80% downstream of S 27th Street. The many box culverts, bridges and storm drainage conduits are overloaded by runoff rates that exceed their design capacity, adding to the flooding threats and shortening their effective lives. This increase in 100-year flows translates into higher flood stages (elevations) and thus spreads out beyond the mapped floodplain boundaries, adding more structures to the flood threat and adding flood depth to those already in the floodplain.

This watershed was developed beginning in the mid-1960s and the City and the State were farsighted enough to acquire as public open space, park land much of the floodplain along the Highway 2 corridor from about 20th to 50th Streets. Most of the structures were kept out of the floodplain, or were elevated. (But with the floodplain creep, some are coming back in.) For damages to structures to occur in the Beal Slough watershed, it

takes a storm frequency of at least a 25-year, and most structures aren't impacted by even a 50-year event, many not until a 100-year event is exceeded.

Haines Branch

Haines Branch begins in Seward County west of Lincoln, runs eastward through Denton, through the south edge of Pioneers Park, and enters Salt Creek where the new Van Dorn Street Bridge crosses Salt Creek. It forms the northern boundary of Wilderness Park and comes into the channelized, with levees, portion of Salt Creek.

The watershed includes approximately 72 square miles of drainage, with more than 95% of it agricultural and acreages. Conestoga Lake, one of the Corps of Engineers flood control reservoirs in the Salt Valley Watershed, is located on a branch of Haines Branch northwest of Denton.

The lower couple of miles of the stream were straightened many years ago and has degraded. The middle and upper portions of the channel are generally in natural condition. A USGS stream gage is located at the SW 56th Street at the bridge over Haines Branch.

There are very few structures in the Haines Branch flood plain, except for a few in the vicinity of Codington and Pioneers Boulevard. The lower end of Haines Branch was included in the 1986 revision to the Flood Insurance Maps for Lincoln.

Middle Creek

Middle Creek begins to the west in Seward County, runs through the communities of Pleasant Dale and Emerald and enters Salt Creek along the north side of Capital Parkway West.

The watershed drains approximately 100 square miles, with essentially all of it being agricultural, non-developed lands. Twin Lakes and Pawnee Lakes (COE flood control reservoirs) are situated in this watershed, on the south and north branches, respectively.

The lower five miles have been wholly or partially straightened since 1900. This has caused the channel to degrade through this reach and also further upstream, deepening and widening. There are almost no structures in the Middle Creek floodplain in the immediate Lincoln area. The channel capacity in the lower end is the approximate 50-year frequency storm. A USGS stream gage is located at the SW 40th Street bridge.

As part of the Salt Creek Flood Study, the COE identified several potential, off-channel, floodwater detention sites. The most effective of these would be located on the south side of Middle Creek in the ½ mile east of SW 40th Streets. It requires the excavation of

approximately 2.6 million cubic yards, encompass over 300 acres, and is estimated to cost $12.8. This detention would help reduce the 100-year flood stage along Salt in Lincoln by 0-6 feet, depending on location. No final design has been prepared and the property is all privately owned.

Antelope Creek

Antelope Creek begins southeast of Lincoln near 91St and Pine Lake Road, runs northeasterly through the center of Lincoln and enters Salt Creek on the northwest corner of the State Fair Park, just east of N 14th Street.

Antelope Creek drains 14 square miles, 6.5 of which are upstream of Holmes Lake. The downstream 7.5 square miles of drainage is essentially 100% urbanized.

Downstream of Holmes Lake, the channel of Antelope Creek has been stabilized with gabions, concrete lining, or travels through an underground conduit. The capacity of the present system ranges from containing 100-year flows in the area between 40th and56th Streets, to containing the 4-year flow in the underground conduit from N to Vine Streets.

There are approximately 1,300 structures in the 100-year flood plain of Antelope Creek. The floodplain reach from N to Vine Streets does not include a designated floodway, and this requires the City to administer the allowable 1.0 foot rise across the entire floodplain.

The Antelope Valley Project will construct a new open water conveyance channel from J Street to the mouth, supplementing the capacity of the current, rehabilitated conduit, and would contain the 100-year flood event within the new channel. A second project part is the removal of the S 38th Street Bridge and replacement of the South Street bridge to eliminate the 100-year overbank flooding in that area.

Lynn Creek

The Lynn Creek Watershed begins north of the Highlands, includes all of the Highlands subdivision and the new planned Fallbrook Development, runs south through Max Roper Park along Interstate 180, through the west side of the Belmont shopping center and enters into Oak Creek near N 10th Street and just south of Cornhusker Highway.

The drainage area for Lynn Creek includes 4.1 square miles, more than 90% of which is now or soon will be developed. The NRD and the City just completed the construction of two temporary floodwater detention structures in the Highlands, just along the north side of the I-80; other detention /retention structures have been or will be constructed as part of other subdivisions.

The Lynn Creek channel has been mostly straightened at some time in the past. Under the N 10th Street bridge is a grade control structure which has prevented the channel from degrading to the depth of Oak Creek; however, significant channel degredation, lateral and vertical, has till occurred, especially through the Park area. The channel through the Park has the capacity of approximately the 10-year storm event.

This watershed was developed beginning in the 1960's in the lower end and along the east side. In the 1980s and 90s the development in the middle and upper reaches took off. Fortunately, the City retained ownership of the floodplain through much of the watershed which limited the number of structures eventually located in the 100-year floodplain. The City further required the developers of the Highlands to set aside funds and lands for the two detention structures completed to offset the additional runoff from the development.

Oak Creek

Oak Creek begins in Butler and Seward Counties to the northwest of Lincoln and runs southwesterly through Valparaiso, Raymond, into and through the Airpark West area, around the south end of the runway, and the east along the west side of Capital Beach Lake, entering Salt Creek just north of State Fair Park, east of N 14th Street.

The Oak Creek Watershed is the largest tributary to Salt Creek upstream of Ashland, draining 272 square miles. Branched Oak Reservoir (COE) and 28 smaller flood control reservoirs in the watershed control significant portions of the watershed upstream of Raymond. Except for the area in the Lincoln Airport properties and Airpark West, the watershed is primarily agricultural and acreage in land use. There are two in-channel grade control structures east of N 14th Street and east of N 1st Street.

The Oak Creek channel was straightened several times in history, as the City and the airport/airbase and Interstate 80 developed. The channel degraded both horizontally and vertically for many miles upstream, and even up some if its tributaries, such as Elk Creek. The 100-year flood plain includes most of the commercial and public buildings on the old Lincoln Airbase area, west of the runways, and essentially all of the area occupied by Capital Beach Lake and the surrounding homes and the businesses in the Westgate Industrial area. However, most of these structures constructed after 1970 have been elevated and built in conformance with the flood plain regulations. The channel capacity in these lower areas is approximately the 50-year flood event, at a minimum. The NRD constructed channel enlargement and low levees along the channel from Capital Beach to the mouth in the late 1970s and early 80s.

AS part of the Salt Creek Study by the Corps of Engineers, several temporary detention sites were located in the lower part of the watershed, the most effective of which is on the west side of the channel west of the south end of the airport runway. This site would encompass nearly 400 acres, involve excavation of 700,000 cubic yards, and have an estimated cost of $4.3. Its effect on the Salt Creek floodplain would be to slightly reduce

the 100-year flood elevation. The NRD is designing and planning streambank stabilization measures along the south bank along the west side of Capital Beach. There is a USGS stream gaging station at one of the bridges through the Airpark.

Dead Mans Run

Dead Mans Run originates in east Lincoln, just south of 84th and A Streets, runs north and northwesterly, through Wedgewood Lake and the University of Nebraska-Lincoln, East Campus, and enters Salt Creek just north of 29th Street and Cornhusker Highway.

The watershed includes 11 square miles of drainage, 100% of which is developed as urban land use. The stream has been straightened all the way from the mouth to upstream of Wedgewood Lake. The channel was severely degraded throughout most of its length, and the District has structurally stabilized the entire channel banks and / or bed with the exception of a segment west of N 48th Street in the East Campus.

The 1986 revision of the flood insurance maps for Lincoln did not include Dead Mans Run, but FEMA followed up with a contract with the Corps of Engineers to restudy this basin. New maps incorporating changes in the Dead Mans Run floodplain were adopted by the City in June 1997. The new maps show large areas of the City now in the 100-year floodplain that were not included in the previous maps. The channel is perched above the floodplain through a significant length of its reach, which makes for a more complex floodplain dynamic due to overbank storage. There are 9 bridges crossing the channel which have varying impacts on the flood flows. There are 816 structures in the 100-year floodplain (729 residential and 87 other), at least 66 of which are in the 12-25 year frequency range. The channel in much of the stream reach has the capacity to contain greater than a 50-year frequency flood event, however, in the critical areas between N33rd and N 48th, the capacity ranges from 12- to 25-year levels.

The Corps of Engineers conducted a reconnaissance level study which was terminated in June 1995. The study looked at several alternative structural schemes to reduce the flood threat, but only one was marginally economically feasible, and was not one which the City, NRD, and UNL could support. The NRD, City, and UNL are currently developing plans for stabilizing the streambanks and beds on Dead Mans Run from N 48th Street to N 42nd Street and on the tributary entering from the south just west of N 48th and Holdrege Streets.

Little Salt Creek

Little Salt Creek begins just north of the Lancaster/Saunders County line and runs south/southeast to Lincoln, crossing under I-80 just east of the N 27th Street interchange and enters Salt Creek about one-half mile north of Superior Street.

The drainage area for Little Salt Creek includes 44 square miles, essentially all of which is undeveloped, agricultural and acreage land use. Some development is occurring in the immediate vicinity of the mouth near the I-80 interchange.

The lower two miles of Little Salt Creek have been straightened as part of road projects in the past. Significant channel degredation has occurred on the lower reaches of the stream, cutting into some of the saline wetlands in the floodplains and draining them. The USGS completed and published in October 2001, a draft report on geomorphic stability in streams in eastern Nebraska, including Little Salt Creek.

There are very few structures in the 100-year floodplain of Little Salt Creek. Depending on the location within the watershed, the channel capacity varies from the 10-year event to about the 50-year event.

Stevens Creek

The Stevens Creek Watershed begins near the Village of Cheney at S 112th Street and Rokeby Road. The stream runs northward, parallel to the east edge of Lincoln, and goes into Salt Creek just north of N 84th Street and Highway 6 (Cornhusker Highway).

The Watershed drains 52 square miles, most of which is agricultural and acreage land use. There is some industrial land use near the lower end off of Highway 6.

With the exception of a short area north of the old RI Railroad, south of Havelock Avenue, the channel has not been straightened and continues its natural course, with significant riparian vegetation in some areas. Some degredation has occurred in the very lower section, however most of the stream is quite stable.

The channel capacity ranges from the 10-year to the 25-year flood event. There are several scattered structures, mostly residential or agricultural, within the 100-year floodplain throughout the watershed, with several industrial and commercial structures in the vicinity of Highway 6.

The NRD is implementing a Stevens Creek Watershed Project which includes the construction of ten small flood control reservoirs which will reduce average annual flood damages by 40%, however, the reduction of the 100-year flood is not significant. The Project also includes the acquisition of permanent flood plain easements on the 100-year floodplain on the four-mile stretch between the Murdock and the Mo Pac East Trails. Some drainage culvert improvements are also planned in the area near Fletcher and west of 84th Street. The District, however, does not intend to amend the floodplain maps after the project is completed.